A Prosodic Structural Approach to English Prefixed Word Stress Assignment

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Introduction

It has been claimed that there are two groups of affixes called class 1 *(-al, -ate, -ic, -ity, -ous, in-,* etc.) and class 2 affixes (*-able, -er, -ful, -ist, -ness, un-,* etc.) in English (Siegel 1974). Words with class 1 affixes are different from words with class 2 affixes in stress placement: class 1 affixation is stress affecting, and class 2 affixation is stress-neutral. Within the framework of Optimality Theory (Prince & Smolensky 1993), Benua (1997) proposes Output-Output correspondence relations and concludes that the difference of stress patterns between class 1 and class 2 affixed words is in the rank of the relevant faithfulness constraints.

In addition to derived words with class 1 and class 2 affixes, there are a number of words derived by adding stressed-affixes in English. These affixes have primary stress on their first syllables. Fukushi (2002) discusses the stress patterns of the derived words with the stressed-suffixes. In addition to the stress-suffixed words, there are some derived words with stressed-prefixes. There are three different stress patterns of English stressed-prefixed words. First, primary stress is falls on the prefix, and secondary stress is on the stem. Second, primary stress is preserved on the stem, and the prefixal stress is changed into secondary. Third, the derived words with no secondary stress. Stress variation is also observed in English prefixed words: dównbèar/downbéar, óutbàlance/outbálance, óverpòwer/òverpówer, úndersìgn/ùndersígn, úpswèep/ùpswéep, etc. Secondary stress in English is one of the challenging prosodic phenomena in Optimality Theory.

In this paper, I will discuss the stress patterns of the derived words with a stressed-prefix. I claim that prefixes may serve as a stressed-prefix, a prosodic clitic and as an independent word. I propose three distinct prosodic word structures for each prefixed word construction and introduce the re-ranking of tied constraints (Crosswhite 1998, Schütze 1997) and the prosodic identity constraint to account for stress variation. Then, I argue that the stress assignment of derived words with stressed-prefix can be correctly accounted for by the interaction of the proposed constraints concerning their distinct prosodic word structures.

This paper is organized as follows: Section 1 presents the data concerning the stress patterns of the words with a stressed-prefix. Section 2 discusses the prosodic status of the stressed-prefix and proposes the relevant prosodic word structures. The analysis of the stress pattern of the stressed-prefixed words is provided in section 3. Conclusion is presented in section 4.

1. Stress Patterns of Prefixed Words

In this section, I will present the data concerning the stress patterns of the derived words with stressed-prefixes. In section 1.1, I will discuss the prosodic status of the stressed-prefix. In section 1.2, three distinct stress patterns of the stressed-prefixed words are exemplified by the data.

1.1 *Stressed-Prefix*

Though the stressed-prefixes in (1) serve as content words that are able to stand alone, they are also able to form derived words by attaching to the base form. From prosodic point of view, these forms can be analyzed as a prosodic word dominated by outer prosodic word, syllables directly dominated by a single prosodic word, or a prosodic word that dominates an inner prosodic word.

(1) after-, back-, down-, off-, on-, out-, over-, under-, up-, etc.

When the derived word is formed by attaching the stressed-prefix to the base, three distinct stress patterns are observed: (i) Primary stress falls on the stressed-prefix, and secondary stress is on the stem; (ii) Primary stress falls on the stem, and no secondary stress is on the stressed-prefix; (iii) Primary stress is on the stem, and secondary stress is on the stressed-prefix.

1.2 *Stress in Prefixed Words*

In most cases, the stress pattern of the derived words is as follows: primary stress is falls on the stressed-prefix, and primary stress on the base form changes into secondary stress in the stem of the derived word.[1] In (2), each base form is marked with parentheses.

(2) a. /after-/
áfterbìrth (bírth), áftereffèct (efféct), áfterlìfe (lífe), áfterpèak (péak), áftertòuch (tóuch)
b. /back-/
báckchàt (chát), bácklàsh (lásh), báckpàck (páck), bácksprìng (spríng)
c. /down-/
dówngràde (gráde), dównhìll (híll), dównstàrt (stárt), dówntìme (tíme), dównwìnd (wínd)
d. /off-/
óffbèat (béat), óffcàst (cást), ófflàp (láp), óffspìn (spín), ófftàke (táke)
e. /on-/
óndìng (díng), ónfàll (fáll), ónlàp (láp), ónrùsh (rúsh), ónsèt (sét)
f. /out-/
óutbrèak (bréak), óutcàmp (cámp), óutfìeld (fíeld), óuthòuse (hóuse), óutpàtient (pátient)
g. /over-/
óveràrm (árm), óvergàrment (gárment), óverlòrd (lórd), óversìze (síze), óvertìme (tíme)

h. /under-/

únderbrùsh (brúsh), úndercùrrent (cúrrent), únderlìfe (lífe), únderpàn (pán)

i. /up-/

úpblàst (blást), úpchèck (chéck), úpdràft (dráft), úpgràde (gráde), úpstròke (stróke)

In addition to the stress pattern shown in (2), there are variations in stress pattern as shown in (3).[2]

(3) /down-/

a. dównbèar (béar), dówncùt (cút), dównfàce (fáce), dówngràde (gráde)

b. downbéar (béar), downcút (cút), downfáce (fáce), downgráde (gráde)

/out-/

c. óutbàlance (bálance), óutclàss (cláss), óutgàme (gáme), óutmàtch (mátch)

d. outbálance (bálance), outcláss (cláss), outgáme (gáme), outmátch (mátch)

In some cases, such as the examples in (3a,c), primary stress is preserved on the stressed-prefix, and primary stress of the base form changes into secondary stress due to the attachment of the stressed-prefix. However, in some cases, such as the examples in (3b,d), the stressed-prefix loses its stress, and the base stress is preserved as primary stress on the stem.

The different stress variations from those in (3) are also observed in the following examples.[3]

(4) /over-/

a. óverbàlance (bálance), óverclòud (clóud), óverlèap (léap), óverpòwer (pówer)

b. òverbálance (bálance), òverclóud (clóud), òverléap (léap), òverpówer (pówer)

/under-/

c. únderchàrge (chárge), úndergò (gó), únderpìn (pín), úndersìgn (sígn)

d. ùnderchárge (chárge), ùndergó (gó), ùnderpín (pín), ùndersígn (sígn)

/up-/

e. úpbùild (búild), úpgàther (gáther), úpròot (róot), úpswèep (swéep)

f. ùpbúild (búild), ùpgáther (gáther), ùpróot (róot), ùpswéep (swéep)

In the derived words (4a,c,e), stressed-prefix has primary stress, and primary stress of the base form is preserved as secondary stress in the output. However, in (4b,d,f), primary stress falls on the stem, and secondary stress is on the stressed-prefix.

In the following section, I will propose that these different stress patterns are attributed to the distinct prosodic structures of the stressed-prefixed words.

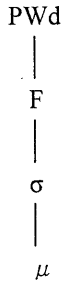
2. Prosodic Structure of Prefixed Words

In this section, I will discuss the prosodic structures of the words which are derived by attaching the stressed-prefix to the base. In section 2.1, I will discuss that the stressed-prefix is a prosodic word. In section 2.2, I propose distinct prosodic structures of the derived words, and that the stress patterns of the derived forms are dependent on proposed prosodic structures. Stress preservation of the derived form is discussed in section 2.3. In section 2.4, I will discuss the secondary stress on the stem and the prefix.

2.1 *Stressed-Prefix as a Prosodic Word*

Generally speaking, it is assumed that units of prosody serve as hierarchical construction. McCarthy & Prince (1993) propose the prosodic hierarchy as in (5).

(5) Prosodic Hierarchy (McCarthy & Prince 1993: 43)



Prosodic hierarchy in (5) shows that hierarchical construction consists of the units of prosody: the mora, μ, the syllable, σ, the metrical foot, F, and the prosodic word, PWd.

According to moraic theory (Hayes 1989), weight distinctions can be made on the basis of the mora count of a syllable: a monomoraic syllable is light, a bimoraic syllable is heavy and a trimoraic syllable is superheavy. It is important to note that CVC syllable in English is regarded as heavy due to Weight by Position (Hayes 1989, 1995, Morén 1998), which requires underlyingly non-moraic codas to surface as moraic. Each of the stressed-prefixes consists of at least two mora and has a head. The data in (6) represents the moraic structure of each stressed-prefix.

(6) The moraic structures of the stressed-prefixes

a. (áfter)$_F$-: $V_\mu C_\mu.CV_\mu$	b. (báck)$_F$-: $CV_\mu C_\mu$	c. (dówn)$_F$-: $CV_\mu V_\mu C_\mu$
d. (fórth)$_F$-: $CV_\mu C_\mu C_\mu$	e. (óff)$_F$-: $V_\mu C_\mu$	f. (ón)$_F$-: $V_\mu C_\mu$
g. (óut)$_F$-: $V_\mu V_\mu C_\mu$	h. (óver)$_F$-: $V_\mu.CV_\mu$	i. (únder)$_F$-: $V_\mu C_\mu.CV_\mu$
j. (úp)$_F$-: $V_\mu C_\mu$		

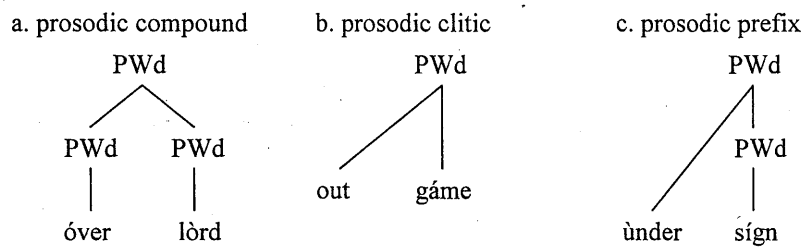
From the moraic count of the stressed-prefixes, it is claimed that the examples in (6a,b,e,f,i,j) are bimoraic, and that the examples in (6c,d,g) are trimoraic. The stressed-prefix in (6h) consists of two monomoraic syllables and is dominated by a single foot.

According to Peperkamp (1995) and Raffelsiefen (1998), prosodic word is the domain of stress assignment. The data in (6) indicate that every stressed-prefix has its own stress, and that it has a proper construction as a prosodic word. Therefore, it can be claimed that stressed-prefix is a prosodic word.

2.2 *Prosodic Structure*

In this section, I will provide the prosodic structures of the words derived by attaching the stressed-prefix to the base, and show that the stress patterns of the derived words can be accounted for by the constraints concerning their distinct prosodic structures. Under the premise that stress variation results from the different prosodizations, I propose three different prosodic structures for each stress patterns of stressed-prefixed words as in (7).

(7) Prosodic structures of the stressed-prefixed words



In the prosodic structure (7a), a prefixal form serves as an independent word. In (7a), each independent word forms an independent prosodic word and is dominated by the outer prosodic word. In this structure, primary stress falls on the stressed-prefix, while secondary stress is on the stem.

In addition to the prosodic structure in (7a), let us discuss this prosodic structure in terms of morphological headedness. Williams (1981a) advances the simplest account of head of compounds and of the words derived by affixes. He defines the head of a morphologically complex word as the rightmost member of that word and attributes this definition to the *Right Head Rule* (RHR). He also argues that the head determines the properties of the whole word. Thus, in the compound noun *overlord*, the rightmost noun *lord* is the head of that word and determines the category of the whole, while the leftmost member *over* cannot be the head.

In terms of prosody, however, it has been claimed that the head of whole prosodic word is not the rightmost element *lòrd* but the leftmost element *óver*. Kubozono & Mizokoshi (1991) argue that in English compound word, primary stress is assigned to the leftmost element, while primary stress on the rightmost element changes into secondary, since in general compound words take trochaic rhythm. I assume that the difference between morphological and prosodical structure is attributed to the constraint interaction concerning proposed prosodic structure.

The prosodic structure in (7b), a prefixal form serves as prosodic clitic and is integrated into a single prosodic word.[4] Here, I assume that this form is a prosodically unfooted syllables, since no stress is

assigned to it. A stem forms a foot and primary stress is assigned to this form.

In the recursive prosodic structure (7c), a prefixal form serves as a stressed-prefix. The stressed-prefix which is dominated by outer prosodic word receives secondary stress, and primary stress falls on the stem which is dominated by inner prosodic word.

The prosodizations in (7b) and (7c) are supported by Williams' (1981a) proposal of morphological headedness. According to him, a suffix determines the category of a word of which it is a part, whereas prefixes do not in general determine the category of the words they attach to. Thus, under the premise that affixes are lexical items, he argues that suffixes are the head of the derived word, since they can occupy head position, in other words, they are the rightmost members of a morphologically complex word, while prefixes are not the head of derived words and do not determine lexical categories, since they never occupy head position. In accordance with Williams' (1981a) account, from prosodic point of view, in the derived verbs *outgame* and *undersign*, the verbs *game* and *sign* are prosodic head of those derived words, while stressed-prefixes *out* and *under* are not.

2.3 *Stress Preservation between Two Output Forms*

As discussed in the previous section, stress paterns of the derived words is generated by their distinct prosodic structures. We see that in (7a) primary stress falls on the stressed-prefix and secondary stress is on the stem. In (7b), primary stress is on the stem, and no secondary stress is on the derived form. In (7c), primary stress falls on the stem and secondary stress is on the stressed-prefix. I assume that these stress realizations in the output forms are attributed to OO-correspondence relation (Benua 1997).

Benua (1997) extends Correspondence Theory (McCarthy & Prince 1995) to paradigmatic relations between words and proposes that two output words that are related by morphological derivation enter into a transderivational faithfulness relation. OO-correspondence relation is regulated by a set of OO-Identity constraints, which demand phonological identity of related elements in the two words.

The transderivational OO-correspondence relation of the stressed-prefixed form is illustrated as in (8).

(8) Transderivational OO-Correspondence relation of stressed-prefixed word

		OO-Correspondence	
	[lórd]	→	[óverlòrd]
IO-Correspondence	↑		↑
	/lord/		/over+lord/

In (8), each word is related to a unique input string by an IO-correspondence relation, and the two output words are related to each other by OO-correspondence. In this case, two output words, the base of a single word *lórd* and the stem of the derived word *óverlòrd*, are in a correspondence relation and stress preservation in derived forms is forced by OO-Identity constraint.

In addition to the discussion above, in the prosodic structure (7b), I assume that stress preservation only holds between the base of the single word *gáme* and the stem of derived word *outgáme,* while

OO-correspondence relation does not relate a single word *óut* to prosodic clitic *out*.

In the prosodic structure (7c), where the prefixal form serves as a stressed-prefix dominated by outer prosodic word, OO-correspondence relation only holds between the base of the single word *sígn* and the stem of the derived word *ùndersígn*.

2.4 *Realization of Secondary Stress*

Prosodic structure in (7a) shows that secondary stress is on the stem, while secondary stress is on the stressed-prefix in (7c). In (7a), primary stress on the base changes into secondary stress in the derived word when the stressed prefixal form dominated by a foot node serves as leftmost prosodic word. In (7c), primary stress is preserved on the stem of the derived word, and secondary stress is on the stressed-prefix. This stress pattern shows that when the stressed prefixal form serves as outer prosodic word, secondary stress is realized on the stressed-prefix.

3. AN OPTIMALITY-THEORETIC ANALYSIS OF THE STRESSED-PREFIX

In this section, I will propose Optimality-theoretic account of the stress pattern of English prefixed words. In section 3.1, I will analyze the prosodic compound. In section 3.2, I will provide an analysis of the stress variation shown in (3) above, and an analysis of the stress variation shown in (4) in section 3.3.

3.1 *Primary Stress on the Stressed Prefixal Form*

In this section, I will discuss the stress pattern of prosodic compound shown in (2). As I claimed in Section 2.2, stress patterns of the derived form where the primary stress falls on the stressed-prefix can be accounted for by the prosodic word structure where both the stressed-prefix and the stem form a prosodic word. I assume that strong foot receives primary stress and secondary stress is on weak foot.

To account for stress preservation, it is necessary to introduce the constraint, ANCHOR $(B/O)_N$, which requires stress preservation between two base forms and output form. I assume that the constraint, ANCHOR $(B/O)_N$, is a domain-specific correspondence constraint for which the relevant domain is the category *noun*, since prosodic compound is only observed in the derived noun.

(9) **ANCHOR $(B/O)_N$**: Stress of two base forms must be preserved in the output form.

Primary stress falls on the stressed prefixal form when it serves as an independent word, in other words, the leftmost prosodic word which coincides with the left edge of outer prosodic word. The location of primary stress is accounted for by the following constraint.

(10) **INDWD-TO-PK**: Align (strong foot, L; outer PWd, L)

The constraint in (10) requires an independent word parsed by strong foot to coincide with the left edge of outer prosodic word.

Also, I introduce the alignment constraint (McCarthy & Prince 1993b). This alignment constraint requires the left edge of the stem to coincide with the left edge of inner prosodic word.

(11) **ALIGN-STEM**: Align (Stem, L; inner PWd, L)

Following Kager (2000), I introduce the limitation of one primary stress per word. I assume that the constraint, UNI-PK is undominated constraint.

(12) **UNI-PK**: Words must have a unique stress peak.

The constraint in (12) bans two primary stresses in a word. The constraint ranking in (13) accounts for the stress pattern of prosodic compound. In the derived form *óverlòrd*, I assume both *óver* and *lórd* are the stem of the output.

(13) base: óver/lórd, output: óverlòrd

	UNI-PK	INDWD-TO-PK	ALIGN-STEM	ANCHOR $(B/O)_N$
☞a. $[[(\acute{o}ver)_F]_{PWd}[(l\grave{o}rd)_F]_{PWd}]_{PWd}$				
b. $[[(\grave{o}ver)_F]_{PWd}[(l\acute{o}rd)_F]_{PWd}]_{PWd}$		*!		
c. $[[(\acute{o}ver)_F]_{PWd}[(l\acute{o}rd)_F]_{PWd}]_{PWd}$	*!	*		
d. $[(\grave{o}ver)_F\ [(l\acute{o}rd)_F]_{PWd}]_{PWd}$			*!	
e. $[[(\acute{o}ver)_F]_{PWd}\ (l\grave{o}rd)_F]_{PWd}$			*!	
f. $[over\ [(l\acute{o}rd)_F]_{PWd}]_{PWd}$			*!	*
g. $[[(\acute{o}ver)_F]_{PWd}\ lord]_{PWd}$			*!	*
h. $[over\ (l\acute{o}rd)_F]_{PWd}$				*!
i. $[(\acute{o}ver)_F\ lord]_{PWd}$				*!

In tableau (13), the undominated constraint, UNI-PK excludes the candidate where two primary stresses are in a single word like (13c). Candidates (13d) and (13e) have the foot forms dominated by outer prosodic word. They fatally violate ALIGN-STEM, since one of the left edges of the stems does not coincide with the left edge of inner prosodic word. Candidates (13f) and (13g) also violate ALIGN-STEM, however, they simultaneously violate ANCHOR $(B/O)_N$, since stress of the base form is not preserved in the output form. Thus, they are not selected as the optimal candidate. Candidates (13h) and (13i) which do not preserve the stress of the base form fatally violate ANCHOR (B/O) and are ruled out. The constraint, INDWD-TO-PK plays an important role in selecting the optimal candidate between (13a) and (13b). The location of primary stress is determined by this alignment constraint. Candidate (13b) where primary stress falls on the rightmost prosodic word violates INDWD-TO-PK, since the stem parsed by strong foot does not coincide with the left edge of outer prosodic word. Candidate (13a), on the other hand, incurs no

violations of the relevant constraints. Thus, candidate (13a) where primary stress falls on the stressed-prefix is selected as optimal.

3.2 *Stress Variation: I*

This section provides an analysis of the variation of stress shown in (3): the derived verb with primary stress on the stressed-prefix and secondary stress on the stem, and the derived verb with no stress on the prefix. The prosodic structure in (7b) indicates that no stress on the stressed-prefix results from the integration of the stressed-prefix into a prosodic word. Primary stress, on the other hand, falls on the stem which is dominated by the same prosodic word. In this case, the following relevant constraints are suited for selecting the desired candidate. First, three prosodic markedness constraints are introduced in (14)-(16).

(14) **HEADEDNESS** (Selkirk 1995): Any C_i must dominate a C_{i-1} (except if $C_i=\sigma$)
e.g. "A PWd must dominate a Ft."

(15) ***SECONDARY**: Secondary stress on the prefix is prohibited.

(16) **PARSE-σ**: Syllables must be footed.

Prosodic markedness constraint in (14) requires every PWd to dominate at least one foot. Following Selkirk (1995), I assume that HEADEDNESS is an inviolable constraint. The constraint in (15), *SECONDARY, puts a ban on the prefix with secondary stress. Candidates where secondary stress is on the stressed-prefix violate this constraint. The constraint in (16) requires all syllables to be parsed by feet. Candidates which have unfooted syllables violate this constraint.

The correspondence constraint in (17) requires the stress preservation between one base form and the output form. This constraint is not domain-specific, but is relevant to the domain other than noun.

(17) **ANCHOR (B/O)**: Stress of one base form must be preserved in the output form.

The prosodic identity constraint in (18) bans the candidates where primary stress of the base changes into secondary stress in the output form.

(18) **IDENT-STRESS**: Primary stress of the base form must be identical to that of output form.

To account for the stress variation shown in (3), I assume, based on the notion of tied constraints (Crosswhite 1998, Schütze 1997), that tied constraints consist of two prosodic markedness constraints, *SECONDARY and PARSE-σ. The theory of tied constraints argues that pair of constraints can be ranked in either order, with the output of each ranking not being subject to competition governed by lower-ranked constraints. In this case, there are two possible rankings between *SECONDARY and PARSE-σ, *SECONDARY «» PARSE-σ, PARSE-σ «» *SECONDARY.[5]

According to Peperkamp (1995), interlinguistic variation could result from different rankings of universal constraints. I propose re-ranking of tied constraints consisting of two prosodic markedness constraints and prosodic identity constraint in order to account for stress variation.

In the case of the examples in (3), the stress pattern of the derived words where primary stress falls on the stressed-prefix can be accounted for by the constraint ranking, *SECONDARY «» PARSE-σ »IDENT-STRESS. On the other hand, the derived word with no secondary stress can be accounted for by the constraint hierarchy, IDENT-STRESS » *SECONDARY «» PARSE-σ.

Tableau (19) accounts for stress pattern of the derived words shown in (3a-c) where primary stress falls on the stressed-prefix. In this case, I assume that when the derived word shows stress variation, the stem of the derived word is the leftmost element.

(19) [6] base: gáme, output: óutgàme

	HEADED-NESS	UNI-PK	INDWD-TO-PK	ALIGN-STEM	ANCH (B/O)	*SEC	PA-σ	IDENT-STRESS
☞a. [[(óut)$_F$]$_{PWd}$[(gàme)$_F$]$_{PWd}$]$_{PWd}$								*
b. [[(òut)$_F$]$_{PWd}$[(gáme)$_F$]$_{PWd}$]$_{PWd}$			*!			*		
c. [[(óut)$_F$]$_{PWd}$[(gáme)$_F$]$_{PWd}$]$_{PWd}$		*!	*					
d. [(òut)$_F$ [(gáme)$_F$]$_{PWd}$]$_{PWd}$						*!		
e. [[(óut)$_F$]$_{PWd}$ (gàme)$_F$]$_{PWd}$				*!				*
f. [out [(gáme)$_F$]$_{PWd}$]$_{PWd}$	*!						*	
g. [[(óut)$_F$]$_{PWd}$ game]$_{PWd}$	*!			*	*		*	
h. [out (gáme)$_F$]$_{PWd}$							*!	
i. [(óut)$_F$ game]$_{PWd}$					*!		*	

Tableau (19) illustrates the evaluation under the ranking where tied constraints outrank the prosodic identity constraint. Candidate (19c) which has two primary stresses is eliminated by violating UNI-PK. Candidates (19f) and (19g) where unstressed syllables are immediately dominated by outer prosodic word are eliminated by violating HEADEDNESS, since this constraint requires every prosodic word to dominate at least one foot form. Candidate (19b) in which the left edge of the strong foot does not coincide with the left edge of the outer prosodic word fatally violates INDWD-TO-PK and is not selected as the optimal candidate. The constraint, ALIGN-STEM which requires the left edge of the stem to coincide with the left edge of inner prosodic word excludes the candidate (19e) where primary stress falls on the stressed- prefix. Candidate (19i) fatally violates ANCHOR (B/O) and is ruled out, since there is no stress preservation between the base and the stem of output form. When we select the optimal candidate among (19a), (19d) and (19h), the constraint ranking, *SECONDARY «» PARSE-σ » IDENT-STRESS, plays a crucial role. Candidate (19d) where secondary stress is on the prefix fatally violates *SECONDARY and is ruled out. Another prosodic markedness constraint, PARSE-σ, excludes the candidate (19h) in which the prefix is not

parsed by foot. Thus, candidate (19a) where primary stress falls on the prefix is the optimal candidate.

Tableau (20) indicates the stress pattern of the derived word in (3b-d) where primary stress falls on the stem of the output form.

(20) base: gáme, output: outgáme

	HEADED-NESS	UNI-PK	INDWD-TO-PK	ALIGN-STEM	ANCH (B/O)	IDENT-STRESS	*SEC	PA-σ
a. [[(óut)$_F$]$_{PWd}$[(gáme)$_F$]$_{PWd}$]$_{PWd}$						*!		
b. [[(òut)$_F$]$_{PWd}$[(gáme)$_F$]$_{PWd}$]$_{PWd}$			*!				*	
c. [[(óut)$_F$]$_{PWd}$[(gáme)$_F$]$_{PWd}$]$_{PWd}$		*!	*					
d. [(òut)$_F$ [(gáme)$_F$]$_{PWd}$]$_{PWd}$							*!	
e. [[(óut)$_F$]$_{PWd}$ (gàme)$_F$]$_{PWd}$				*!		*		
f. [out [(gáme)$_F$]$_{PWd}$]$_{PWd}$	*!							*
g. [[(óut)$_F$]$_{PWd}$ game]$_{PWd}$	*!			*	*			*
☞h. [out (gáme)$_F$]$_{PWd}$								*
i. [(óut)$_F$ game]$_{PWd}$					*!			*

In tableau (20), re-ranking of the tied constraints and prosodic identity constraint, IDENT-STRESS » *SECONDARY «» PARSE-σ, plays an important role in selecting the optimal candidate among (20a), (20d) and (20h). Candidate (20a), where secondary stress is on the stem, is ruled out by violating IDENT-STRESS, since the identity of primary stress does not hold between the base form and the stem of output form. Secondary stress is on the prefix in the candidate (20d). This candidate is not selected as optimal, since it fatally violates the prosodic markedness constraint, *SECONDARY. Thus, candidate (20h), in which the prefix and stem are integrated into a prosodic word and primary stress falls on the stem, is the winner.

3.3 *Stress Variation: II*

This section presents an analysis of the stress variation of the derived verbs shown in (4). The prosodic word structure in (8c) indicates that a prefixal form serves as a stressed-prefix and forms weak foot that is dominated by outer prosodic word, and that the stem forms strong foot dominated by inner prosodic word.

In this case, the constraint ranking, *SECONDARY «» PARSE-σ » IDENT-STRESS, accounts for the stress pattern in (4a,c,e) where primary stress is on the prefix, and IDENT-STRESS » PARSE-σ «» *SECONDARY, correctly accounts for the pattern in (4b,d,f) where secondary stress is on the prefix.

Tableau (21) accounts for the stress pattern of the derived word in (4a,c,e). In the case of the data in (4), I assume that the stem of the derived form is the leftmost element.

(21) base: sígn, output: úndersìgn

	HEADED-NESS	UNI-PK	INDWD-TO-PK	ALIGN-STEM	ANCH (B/O)	*SEC	PA-σ	IDENT-STRESS
☞a. [[(únder)$_F$]$_{PWd}$[(sìgn)$_F$]$_{PWd}$]$_{PWd}$								*
b. [[(ùnder)$_F$]$_{PWd}$[(sígn)$_F$]$_{PWd}$]$_{PWd}$			*!			*		
c. [[(únder)$_F$]$_{PWd}$[(sígn)$_F$]$_{PWd}$]$_{PWd}$		*!	*					
d. [(ùnder)$_F$ [(sígn)$_F$]$_{PWd}$]$_{PWd}$						*!		
e. [[(únder)$_F$]$_{PWd}$ (sìgn)$_F$]$_{PWd}$				*!				*
f. [under [(sígn)$_F$]$_{PWd}$]$_{PWd}$	*!						*	
g. [[(únder)$_F$]$_{PWd}$ sign]$_{PWd}$	*!			*	*		*	
h. [under (sígn)$_F$]$_{PWd}$							*!	
i. [(únder)$_F$ sign]$_{PWd}$					*!		*	

In tableau (21), candidate (21a) where primary tress is on the prefix is selected as optimal due to the domination of tied constraints over the prosodic identity constraint.

Tableau (22) accounts for the stress pattern of the derived form where secondary stress is on the prefix. Re-ranking of the tied constraints and the prosodic identity constraint plays a crucial role in candidate selection.

(22) base: sígn, output: ùndersígn

	HEADED-NESS	UNI-PK	INDWD-TO-PK	ALIGN-STEM	ANCH (B/O)	IDENT-STRESS	PA-σ	*SEC
a. [[(únder)$_F$]$_{PWd}$[(sìgn)$_F$]$_{PWd}$]$_{PWd}$						*!		
b. [[(ùnder)$_F$]$_{PWd}$[(sígn)$_F$]$_{PWd}$]$_{PWd}$			*!					*
c. [[(únder)$_F$]$_{PWd}$[(sígn)$_F$]$_{PWd}$]$_{PWd}$		*!	*					
☞d. [(ùnder)$_F$ [(sígn)$_F$]$_{PWd}$]$_{PWd}$								*
e. [[(únder)$_F$]$_{PWd}$ (sìgn)$_F$]$_{PWd}$				*!		*		
f. [under [(sígn)$_F$]$_{PWd}$]$_{PWd}$	*!						*	
g. [[(únder)$_F$]$_{PWd}$ sign]$_{PWd}$	*!			*	*		*	
h. [under (sígn)$_F$]$_{PWd}$							*!	
i. [(únder)$_F$ sign]$_{PWd}$					*!		*	

In tableau (22), re-ranking of tied constraints and the prosodic identity constraint, IDENT-STRESS » PARSE-σ «» *SECONDARY, does not select the candidates (22a) and (22h) as optimal due to their violations of the constraint, IDENT-STRESS and PARSE-σ, respectively. Thus, candidate (22d) where secondary stress is on the prefix is the optimal.

4. CONCLUSION

In this paper, I have discussed the stress patterns of English derived words. To account for the stress patterns of the derived word with stressed-prefix, I proposed three prosodic word structures of prefixed words and showed that the stress patterns of the derived words are accounted for by the interaction of the proposed constraints concerning their distinct prosodic structures. In the analysis of the derived verbs, particularly, I also introduced the re-ranking of tied constraints and the prosodic identity constraint to account for the stress variation.

In the case of the derived words with stressed-prefix, the constraint hierarchy, *SECONDARY «» PARSE-σ » IDENT-STRESS, plays a crucial role in accounting for the primary stress on the stressed-prefix.

On the other hand, the variants where primary stress does not fall on the prefix are correctly accounted for by positing the prosodic identity constraint higher than tied constraints in the constraint hierarchy. Derived words with no secondary stress are accounted for by the constraint ranking, IDENT-STRESS »*SECONDARY «» PARSE-σ, and derived forms where secondary stress is on the prefix are accounted for by the constraint hierarchy, IDENT-STRESS » PARSE-σ «» *SECONDARY. The analysis presented in this paper allows us a unified account for the stress patterns of the derived words with stressed-prefix.

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NOTES

1 The stress patterns in (2) are identical to the stress patterns of English compound nouns. All the data presented in this paper are based on *Webster's Third New International Dictionary (1971)*. However, according to Kenyon & Knott (1953), some of the stress patterns of derived words in (2) are as follows: dównhìll/downhíll, óffcást, óutfield/óutfield. In this paper, I do not discuss their descriptions of stress patterns of the derived words.

2 The stress variation in (3) is observed in derived words that serve as a verb. Kenyon & Knott (1953) describe the stress pattern of the word like *outbalance* and *outclass* without stress variation: outbálance, outcláss.

3 The examples in (4) also serve as a verb. In Kenyon & Knott (1953), following stress patterns are described without stress variation: òverbálance, òverclóud, òverléap, òverpówer, úndercharge, ùndergó, ùnderpín, ùndersígn, upbúild, upgáther, upróot, upswéep.

4 Selkirk (1995) proposes four possible prosodizations of Fnc-Lex sequences, and argues that the prosodic structure such as $[\text{fnc}[\text{lex}]_{\text{PWd}}]_{\text{PPh}}$ is correct. In this paper, however, I do not treat the prosodic structure in which *fnc* is immediately dominated by phonological phrase, since I assume that in the case of the data (3 b,d) prosodic clitic is not in phrasal level phonology, but rather in word level.

5 The bi-directional arrows stand for a tie between the constraints immediately to either side of them.

6 Following Crosswhite (1998), I will indicate tied constraints using the absence of an intervening line between two constraint columns.

REFERENCES

Benua, Laura (1997) *Transderivational Identity: Phonological Relation Between Words.* Doctoral dissertation, University of Massachusetts, Amherst.

Crosswhite, Katherine (1998) Segmental vs. prosodic correspondence in Chamorro. *Phonology* 15, 281-316.

Fukushi, Tomoya (2002) The prosodic structure of stressed-suffix in English. *Proceedings of the 56th Conference of the Tohoku English Literary Society*, 49-55.

Hayes, Bruce (1989) Compensatory lengthening in moraic phonology. *Linguistic Inquiry* 20, 253-306.

Hayes, Bruce (1995) *Metrical Stress Theory: Principles and Case Studies*. Chicago: University of Chicago Press.

Kenyon, John S. and Thomas A. Knott (1953) *A Pronouncing Dictionary of American English*, 4th ed. Springfield, Mass: G.C. Merriam Co.

Kager, René (2000) Stem stress and peak correspondence in Dutch. In J. Dekkers, F. van der Leeuw, and J. van de Weijer (eds.), *Optimality Theory: Phonology, Syntax, and Acquisition*. Oxford: Oxford University Press, 121-150.

Kubozono, Haruo, and Akira Mizokoshi (1991) *Eigo no hatsuon to eishi no inritsu*. Tokyo: Eichosha.

McCarthy, John, and Alan Prince (1993) *Prosodic Morphology I: Constraint Interaction and Satisfaction.* Ms., University of Massachusetts, Amherst, and Rutgers University.

McCarthy, John, and Alan Prince (1993b) Generalized alignment. In G. Booij and J. van Marle (eds.), *Yearbook of Morphology 1993*, 79-153.

McCarthy, John, and Alan Prince (1995) Faithfulness and Reduplicative Identity. In J. Beckman, L. Walsh-Dickey and S. Urbanczyk (eds.), *University of Massachusetts Occasional Papers in Linguistics 18: Papers in Optimality Theory,* 249-384.

Morén, Bruce (1998) The puzzle of Kashimiri stress: implications for weight theory. Ms., University of Maryland, College Park. ROA-273.

Peperkamp, Sharon (1995) Enclitic stress in Romance. *CLS 31: Parasession on Clitics,* 234-249.

Prince, Alan, and Paul Smolensky (1993) *Optimality Theory: Constraint Interaction in Generative Grammar.* Ms., Rutgers University, New Brunswick, and University of Colorado, Boulder.

Raffelsiefen, Renate (1998) Phonological constraints on English word formation. In G. Booij and J. van Marle (eds.), *Yearbook of Morphology 1998*, 225-287.

Schütze, Carson (1997) The prosodic structure of Serbo-Croatian function words: An argument for tied constraints. *MIT Working Papers in Linguistics* 30, 335-367.

Selkirk, Elisabeth (1995) The prosodic structure of function words. In J. Beckman, L. Walsh-Dickey and S. Urbanczyk (eds.), *University of Massachusetts Occasional Papers in Linguistics 18: Papers in Optimality Theory,* 439-469.

Siegel, Dorothy (1974) *Topics in English Morphology*. Doctoral dissertation, MIT.

Webster's Third New International Dictionary (1971) Springfield, Mass: G.C. Merriam Co.

Williams, Edwin (1981a) On the notions 'lexically related' and 'head of a word'. *Linguistic Inquiry* 12, 245-274.

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